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New taxa and new records of Australian Panchaetothripinae (Thysanoptera, Thripidae)

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Abstract

A new genus and species of panchaetothripine thripid, *Stosicthrips szitas*, apparently related to *Parthenothrips dracaenae*, is described from leaves of a cultivated *Grevillea* (Proteaceae) in central Queensland and also at Perth, Australia. In another genus, *Bhattithrips*, a new species *B. borealis* is described from northern Australia, and the four members of this Australian genus are distinguished in a key. A species described from Southeast Asia, *Astrothrips aureolus*, is established and probably native to northern Australia, where it damages the leaves of an *Hymenocallis* cultivar (Amaryllidaceae).

Key words: *Parthenothrips dracaenae, Bhattithrips, Astrothrips*, new species, new genus

Introduction

The Panchaetothripinae is one of the four subfamilies recognised in the family Thripidae. This subfamily comprises the thrips with strongly reticulate cuticle on body and legs, and includes *Heliothrips haemorrhoidalis*, the ubiquitous Greenhouse Thrips (Mound et al., 2001). With the description of the new genus below, 39 panchaetothripine genera are now recognised worldwide, and of these 18 are known from Australia. Four of these genera involve immigrant species from other continents: *Hercinothrips* from Africa, *Heliothrips* and *Selenothrips* from South America, and *Caliothrips* with two species from Asia and Africa, plus a third recorded in Australia only from specimens taken in quarantine on oranges imported from western North America.

Seven of the 18 genera known from Australia involve species that are probably native to this continent but that are shared with Southeast Asia (Table 1). These occur in Australia only in the tropical north, with one extending southwards into northern New South Wales. In contrast, two Old World tropical genera both include a single species considered to be endemic to Australia, *Helionothrips spinosus* in eastern Australia, and *Panchaetothrips timonii* in the far northwest (Mound, 2009). Only four of the 18 genera are clearly endemic to Australia - *Australothrips*, *Bhattithrips* and *Moundothrips*, plus the new genus *Stosicthrips* which is described below. The closest relative of this new genus is *Parthenothrips*, a monobasic genus found worldwide but possibly also Australian in origin.

Evidence is increasing for a strong relationship between the thrips fauna of northern Australia and that of Southeast Asia (Mound & Azidah, 2009; Mound & Tree, 2009). This is further emphasised by the identification recently of two more Asian species in Australia. *Helionothrips errans* (Williams), a pest of orchids, was found at Perth in Western Australia in December 2007, and then at Newcastle in eastern New South Wales in May 2008; this species is probably transported by the horticultural trade. In contrast, *Astrothrips aureolus* Stannard & Mitri appears to be widely established, and is possibly native to northern Australia. Several females of *A. aureolus* were taken separately at Darwin, Holmes Jungle, September 2009,

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apparently aestivating during the dry season amongst a thick growth of the Fabaceae vine *Centrosema mollis*. This series included macropterae, hemimacropterae and a microptera. Moreover, one female was taken in August 2004 at Port Douglas in northern Queensland, and the species was found causing extensive damage to the leaves of ornamental *Hymenocallis* plants both at Darwin, May 2001 and Cairns, November 2008. This thrips previously was known only from one female taken in quarantine at Hawaii, on *Hymenocallis* imported from Malaysia (Wilson, 1975). Finally, a few damaged specimens of an apparently undescribed species of the Asian genus *Aoratothrips* were collected near Cape Tribulation in northern Queensland. This is reported in an identification and information system treating the known Australian species and genera of Panchaetothripinae (Mound, 2009). Full nomenclatural and synonymy details for all thrips taxa discussed in this paper are available at: http://www.ento.csiro.au/thysanoptera/worldthrips.html

TABLE 1. Australian Panchaetothripinae

Australian endemic species
Australothrips aliceae (northern Australia)
Australothrips bicolor (Australia-wide)
Bhattithrips borealis (northern Australia)
Bhattithrips dahmsi (tropical eastern Australia)
Bhattithrips frontalis (eastern Australia)
Bhattithrips pitkini (eastern Australia)
Helionothrips spinosus (eastern Australia)
Moundothrips apterygus (south eastern Australia)
Panchaetothrips timonii (north western Australia)
Parthenothrips dracaenae (worldwide)
Stosicthrips szitas (Queensland and Perth, Australia)
Asian species possibly native to Australian tropics
Anisopilothrips venustulus (worldwide)
Aoratothrips ?sp.n. (Indonesia)
Astrothrips aureolus (Asia)
Astrothrips tumiceps (Asia)
Copidothrips formosus (Asia, Pacific)
Elixothrips brevisetis (Asia, Pacific)
Phibalothrips longiceps (Asia)
Retithrips javanicus (Indonesia)
Species introduced to Australia
Caliothrips fasciatus (California, quarantine intercept at Perth)
Caliothrips graminicola (Africa; India)
Caliothrips striatopterus (Indonesia)
Helionothrips errans (Asia, now widespread)
Heliothrips haemorhoidalis (South America, now widespread)
Hercinothrips bicinctus (Africa, now widespread)
Hercinothrips femoralis (Africa, now widespread)
Selenothrips rubrocinctus (South America, now widespread)

Stosicthrips gen.n.

Macropterous panchaetothripinae with major setae translucent and broadly flattened (Fig. 6); antennae 7-segmented (Fig. 4), V–VII closely joined, sensoria on III–IV forked. Head reticulate (Fig. 2), fore ocellus small on slight longitudinal ridge; compound eyes large with at least five pigmented facets; maxillary palps 2-

segmented. Pronotum reticulate with several pairs of large translucent setae with large basal pores. Mesonotum without longitudinal division (Fig. 2). Metascutum reticulate with one pair of large setae medially, no campaniform sensilla; metascutellum reticulate. Mesothoracic furca transverse, metafurca weakly transverse, both without spinula. Femora and tibiae reticulate, tarsi 1-segmented. Forewing broad, parallel-sided, apex sub-acute; costa with no cilia; first vein fused to costa, bearing about 12 setae, second vein with about nine setae; all setae translucent, broadly flattened, each about as wide as a wing vein and with large basal pore on prominent tubercle; clavus with three veinal but no discal setae. Tergite II not constricted; tergal median setae small; lateral thirds of tergites with granulate sculpture (Fig. 3), posterior margins with broad craspedum; tergites VII–VIII without setae medially on antecostal ridge; setae on IX no longer than X; tergite X almost symmetrical, median split almost complete. Sternites II–VII with broad craspedum, transversely reticulate, marginal setae small. Male with transverse pore plate medially on sternites III–VII; tergite IX without thorn-like setae medially.

Type species *Stosicthrips szitas* sp.n.

Relationships

Despite the lack of a central rhachis to the broadly flattened major setae, the closest relative to this new genus appears to be *Parthenothrips*. These two genera are similar in the following: shape of forewing apex, lack of costal cilia, wing venation, and broad veinal setae each arising from a prominent tubercle; also, shape of furca of mesothorax and metathorax, structure of tergites and sternites, and sternal pore plates of males (only on IV–VII in *Parthenothrips*). The antennae are of seven segments in both taxa, although the sensoria are different in shape and form. In contrast, the larvae of this new species bear very short major setae that are quite unlike the elongate capitate setae of larval *Parthenothrips*. In eastern Australia, *P. dracaenae* has been found widely on various ferns, and thus might well have originated in Australia, despite its current pantropical distribution and suggested African origin (Wilson, 1975).

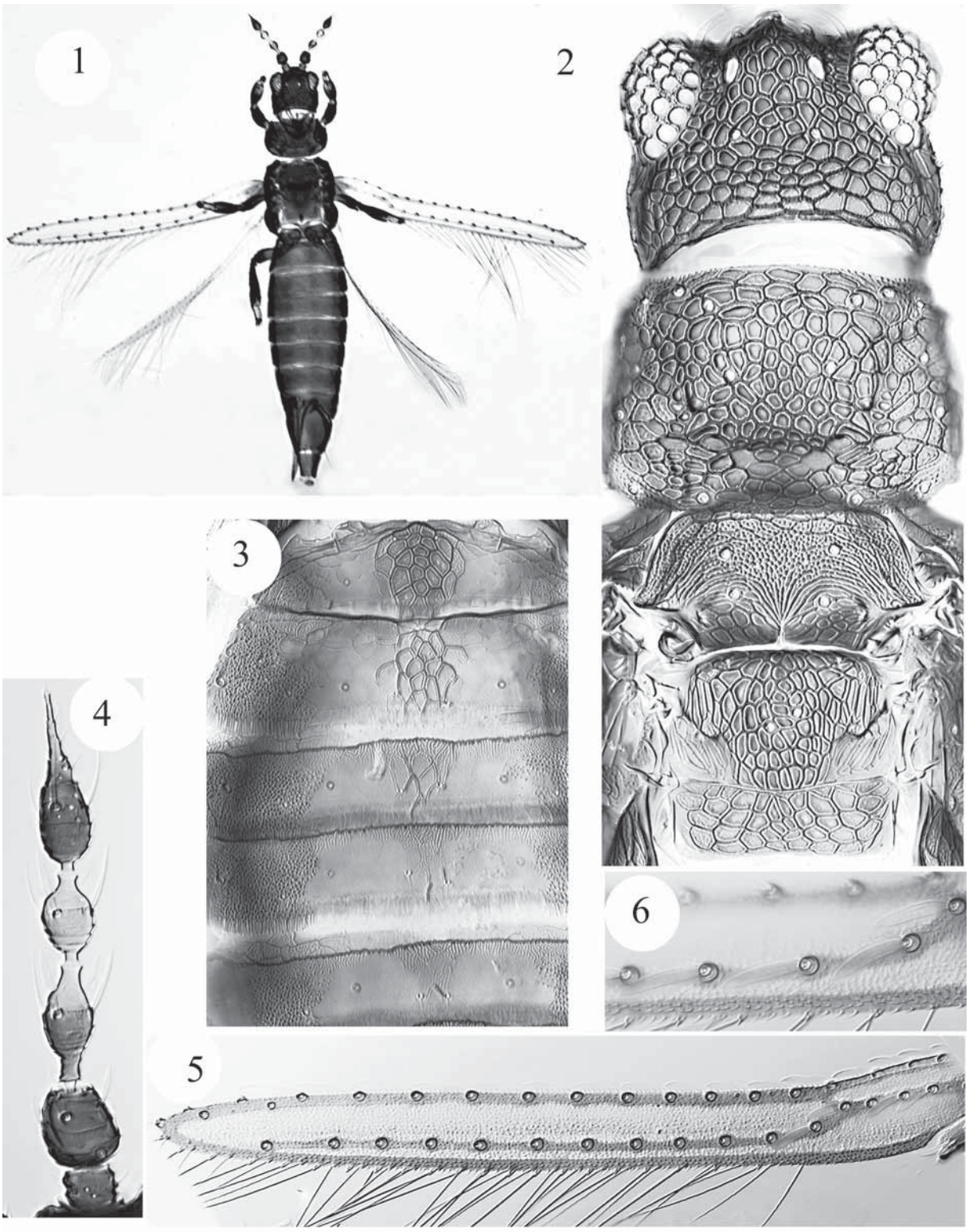
***Stosicthrips szitas* sp.n.**

Female macroptera. Body and legs brown, tarsi yellow (Fig. 1); antennae brown with apex of III and all of IV yellow (Fig. 4); forewing pale with light brown veins (Fig. 5); all major setae colourless and translucent. Head with three pairs of postocular setae and one pair of setae posterolaterally on cheeks; ocellar setae II long, ocellar setae III small and on anterior margins of triangle. Antennal segment II dorsally with three large setae; III and IV with pair of large dorsal setae, apex of both segments constricted to short neck, and forked sensorium ventral in both segments; segment V strongly constricted at base, with one long pointed seta extending almost to apex of VII; segments V–VII broadly joined. Mesonotum with complex granulate sculpture medially (Fig. 2). Tergites I–III with small area of prominent reticulation medially, these areas weaker on more posterior tergites; submedian areas of tergites smooth, without sculpture, lateral areas with extensive granulation (Fig. 3).

Measurements (holotype female in microns). Body length 1000. Head, length 95; width across eyes 135. Pronotum, length 100; maximum width 160. Forewing length 730; longest costal seta 50. Tergite IX setae S1 50. Tergite X setae S1 35. Antennal segments length, I 15, II 35, III 50, IV 35, V–VII 75.

Male macroptera. Similar to female, abdomen more slender; tergite IX without stout setae; pore plates present on sternites III–VII.

Larva II. Mainly yellow, light grey markings on antennae, anterior margin of head, and tibiae; antennal segments with annuli but no microtrichia; all major body setae capitate but scarcely longer than diameter of basal pores; dorsal surface of thorax and abdomen weakly tuberculate; tergite IX without marginal tubercles.



FIGURES 1–6. *Stosicthrips szitas*. **(1)** female. **(2)** head and thorax. **(3)** abdominal tergites I–V. **(4)** antenna. **(5)** forewing (setae translucent). **(6)** forewing setae.

Specimens studied. Holotype female, **Australia, Queensland**, Glenmorgan, Myall Park, leaves of *Grevillea hakeoides* (Proteaceae), 11 March 2006 (LAM4867).

Paratypes: 8 female 2 male taken with holotype; 4 female 2 male, same locality and date, from *Grevillea* Robyn Gordon; **Western Australia**, Perth Domestic Airport, leaves of *Grevillea* Robyn Gordon, 13 female 2

male, 17.i.2005 (Hoddle & Stosic 278), same locality and plant, 3 female 3 male, 11.ii.2005, 5 female 2 male, 18.ii.2005 (Andras Szitas).

Comments. This species was first collected by Christina Stosic and Mark Hoddle during a survey of likely sites where the potentially invasive Californian bean thrips might have become established in Australia (Hoddle et al. 2006). Near the entrance to Perth Airport, they found a series of adults of the new species on decorative plantings of the *Grevillea* cultivar, "Robyn Gordon". Subsequently, Andras Szitas, of the Western Australia Department of Agriculture, visited this site to ascertain if the thrips species was established on the "Robyn Gordon" plants rather than a chance vagrant, because the possibility had to be considered that the insect had entered Australia through air traffic. Such an introduced species would be expected to occur on various plants in the vicinity, not on a single Australian native plant; no specimens were found other than on the *Grevillea*. Shortly after, this same new thrips species was found breeding in substantial numbers in central Queensland, at the Myall Park Botanic Garden near Glenmorgan, where the cultivar "Robyn Gordon" was originally developed. Adults and larvae were abundant at that site not only on the cultivar, but also on one of the parent species, *Grevillea hakeoides*. There is thus little doubt that this thrips is an Australian endemic, although it has not yet been found at any other site. The natural distribution of *G. hakeoides* is in Western Australia, extending in a broad inland band from Shark Bay to the wheat belt east of Perth.

Bhattithrips Mound

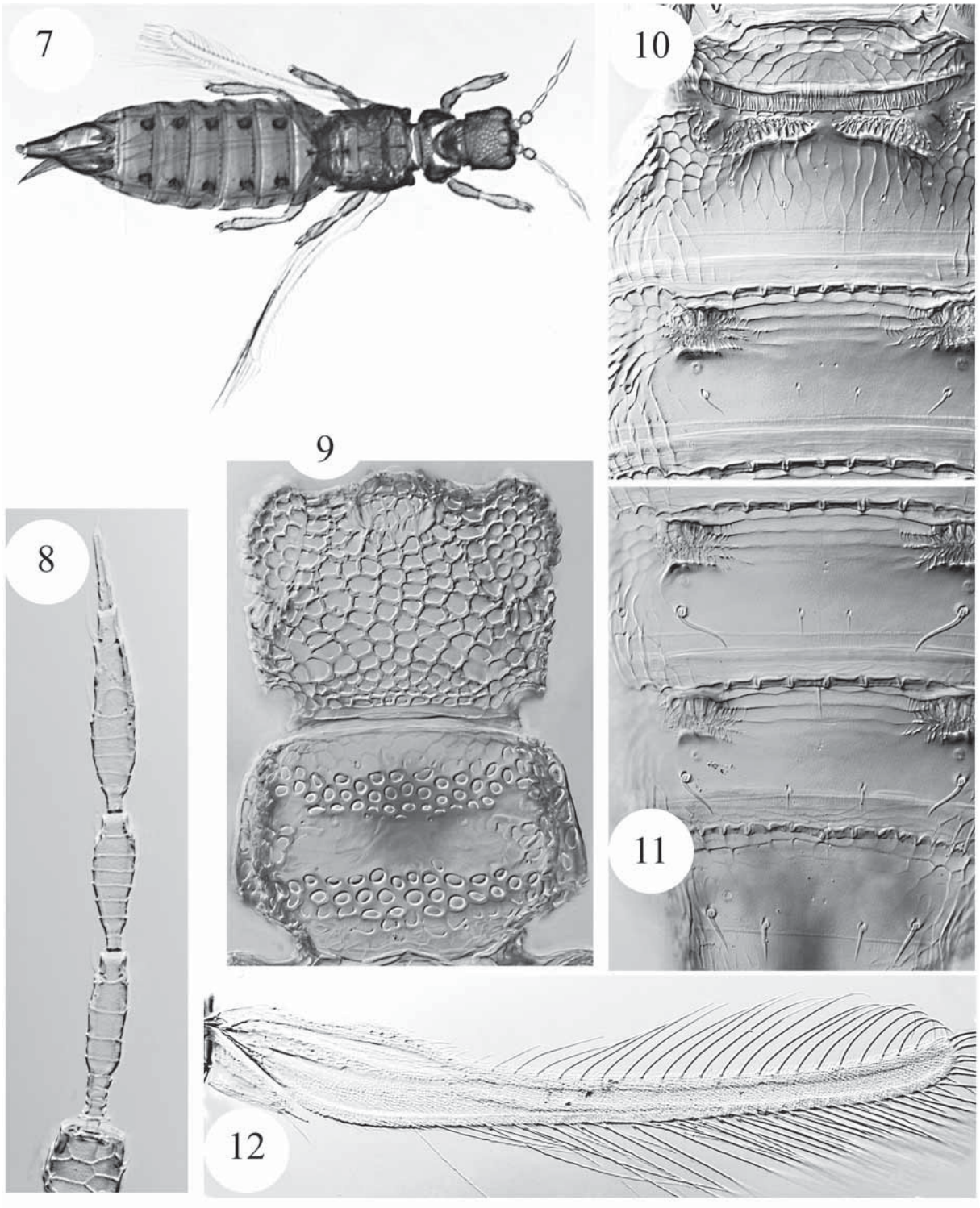
Bhattithrips Mound, 1970: 44. Type-species *Heliothrips frontalis* Bagnall

Nothing is known of the biology of any of the four species here recognised in this genus, but each is presumed to be leaf-feeding. The genus does not seem to be related to any other Australian Panchaetothripinae, although it is closely related to a monobasic New Zealand genus, *Sigmothrips*. This has been found living on the seedlings of several unrelated plants in New Zealand (Mound & Walker, 1982), and *Bhattithrips* species possibly have a similar host association. *S. aoteroana* differs from the species of *Bhattithrips* in having swollen cheeks and elongate setae on the ninth abdominal tergite (Ward, 1970), but the relationships of these two genera to other Panchaetothripinae are not clear. The two share with *Astrothrips* the presence on tergite II of specialised areas of sculpture that comprise broadly based and strongly curved microtrichia. However, in *Astrothrips* species these areas are anterolateral on tergite II, but in *Bhattithrips* (Fig. 10) and *Sigmothrips* they are sub-median. The most probable relatives to these two antipodean genera are members of the Neotropical genus *Dinurothrips* (Mound et al., 2001). Character states used previously in identification keys to *Bhattithrips* species (Mound, 1970; Wilson, 1975) have been found to be variable, but the sculpture of tergites II–IV is characteristic in each of the four species.

Key to species of *Bhattithrips*

1. Tergites III–VII with sculpture lacking sub-circular invaginations that bear numerous microtrichia (Fig. 13) [male hemimacropterous] ..... *pitkini* Mound
-. Tergites III–VII with sub-circular invaginations bearing numerous microtrichia, overlying dorso-ventral muscle insertion points (Figs 14–15) 2
2. Tergal invaginations with prominent circular rim; tergite II with transverse length of submedian patches of microtrichia about equal to the distance between them (Fig. 14) [male hemimacropterous]..... *frontalis* (Bagnall)
-. Tergal invaginations without prominent rim; tergite II with transverse length of submedian patches of microtrichia longer than distance between them (Figs 10, 15)..... 3
3. Antennal segments V–VIII forming a unit about 4 times longer than maximum width, segment III less than 3 times longer than wide (Fig. 18); sensoria on antennal segments III–IV curved around segment apex, usually forked; tergite II sub-median patch of microtrichia S-shaped (Fig. 15); microtrichia of tergal invaginations not extending to surrounding sculpture; forewing major setae longer than width of wing veins [male macropterous] ..... *dahmsi* Mound

-. Antennal segments V–VIII forming a unit more than 6 times longer than maximum width, VIII distinct; segment III about 6 times longer than wide (Fig. 8); sensoria on antennal segments III–IV simple and straight; tergite II submedian patch of microtrichia transverse (Fig. 10); microtrichia of tergal invaginations extending medially to transverse lines of sculpture (Fig. 11); forewing veinal setae no longer than microtrichia [male not known] .... *borealis* sp.n.



FIGURES 7–12. *Bhattithrips borealis*. **(7)** female. **(8)** antenna. **(9)** head and pronotum. **(10)** abdominal tergites I–III. **(11)** abdominal tergites VI–VIII. **(12)** forewing.

***Bhattithrips borealis* sp.n.**

Female macroptera. Body light brown to yellow, legs and antennae yellow, forewing pale with base and veins slightly yellow. Head strongly reticulate, cheeks almost parallel but sharply constricted to basal neck (Fig. 9); ocellar hump scarcely overhanging inter-antennal region; without major setae. Antennae slender, 6-segmented, V–VII closely fused, VIII distinct (Fig. 8); sensoria on III and IV short and simple. Pronotum with two transverse bands of round to oval reticulation (Fig. 9). Mesonotum with complete median longitudinal division. Metanotal median triangle weakly indicated; median reticles elongate with thick flattened walls, medial setae minute. Meso and metathoracic furca transverse. Forewing base broad (Fig. 12), veinal setae scarcely larger than microtrichia; costal cilia longer than wing width. Abdominal tergite II with pair of sub-median transverse depressions filled with microtrichia, laterally these depressions are very weakly S-shaped (Fig. 10); tergites III–VII with paired lateral invaginations filled with microtrichia that also extend medially onto sculpture lines (Fig. 11); III–VIII with pair of sigmoidal setae (weak on VIII) (Figs 10, 11); VII–VIII with one setae medially on antecostal ridge (Fig. 11); IX with setae S2 about twice as long as S1, but S3 almost half as long as X; tergite X asymmetric, median split complete, terminal setae minute. Sternites with setae arising almost at margin; III–VII with paired circular, stoutly walled, invaginations at dorso-ventral muscle insertions.

Measurements (holotype female in microns). Body length 1370. Head, length 160; width across eyes 175. Pronotum, length 125; maximum width 200. Forewing length 630; longest costal seta 10. Tergite IX setae S1 20. Tergite X setae S1 10. Antennal segments I–VII length 25, 40, 75, 55, 85, 30.

Specimens studied. Holotype female, **Australia, Northern Territory**, Humpty Doo, from grasses, 15.v.1999 (LAM 3713).

Paratypes: 5 females taken with holotype; same locality, 1 female from grasses, 28.vi.2000.

Comments. Although closely related to *B. dahmsi*, this new species differs in the far more slender form of the antennae, and also in having antennal segment VIII distinct although V–VII are fused (Figs 8, 18). This is the only species in the genus in which microtrichia extend along the lines of sculpture on the tergites from the sub-median muscle insertion depressions (Fig. 11).

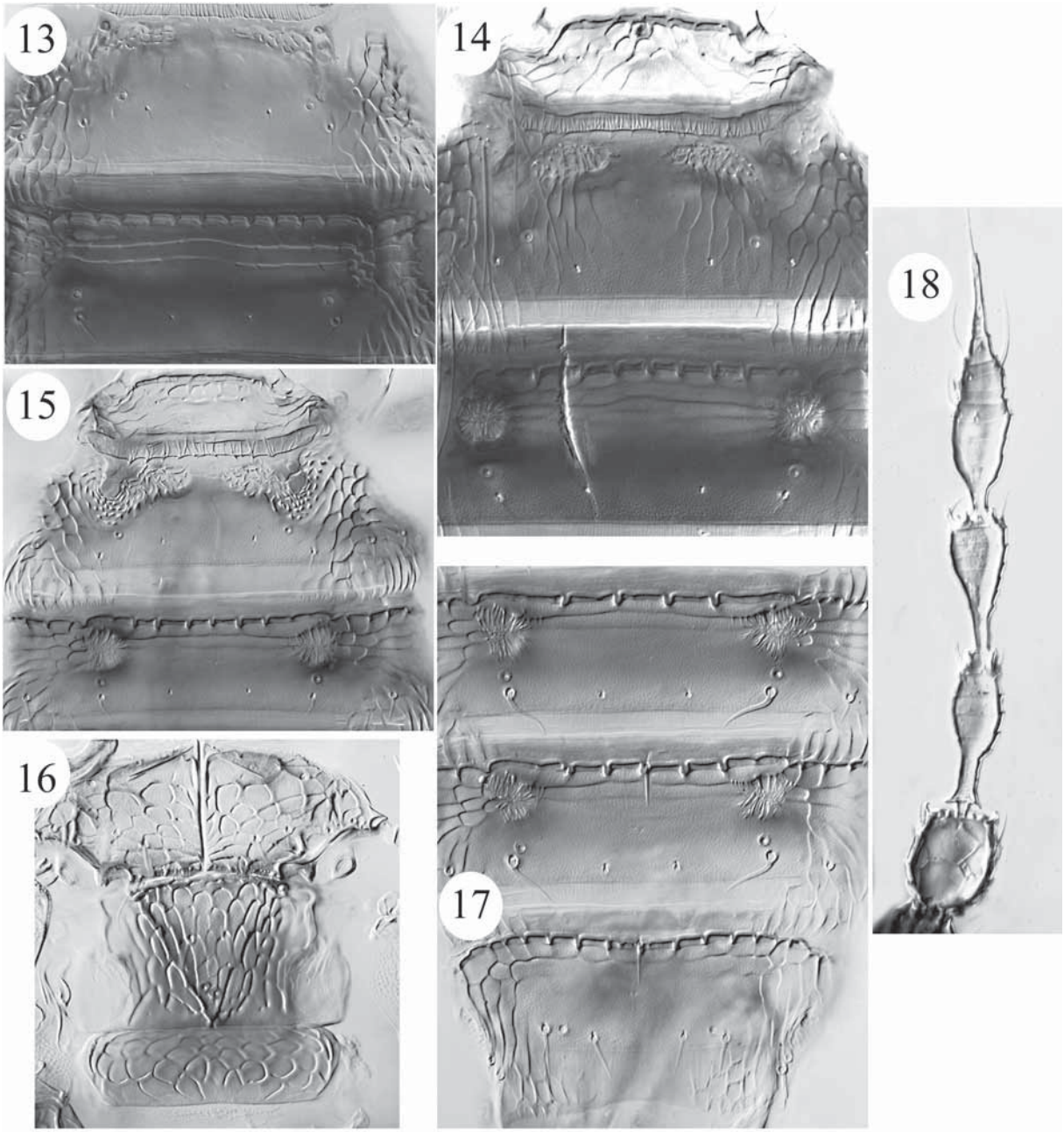
***Bhattithrips dahmsi* Mound**

This species was described from two females and one male collected at two sites in south eastern Queensland. However, single females identified as this species have now been studied from three sites in northern Queensland, Mossman, Cape Tribulation and Cape York. The antennae of the type specimens are unusually variable. In the holotype, segments V–VIII are fused, but in the female paratype there are distinct sutures between these segments. On segment IV of all three original specimens the sensorium is Y-shaped, but the length of the basal stem of the Y varies from short with the distal arms slender and curving around the base of the succeeding segment, to as long as the distal arms of the sensorium with these arms then less curved. On segment III, the sensorium is simple on both antennae of the female paratype, but on the holotype and male paratype this sensorium is simple on one antenna but forked on the other. One female from Mossman and two females from Cape Tribulation and Cape York have both sensoria forked from a short stem, long and curving around the base of the next segment. In the Cape Tribulation female, the distal segments are distinct from each other with the base of VI constricted, whereas in the Cape York female, the distal segments of the right antenna are completely fused, but those of the left antenna are distinguished by weak sutures.

***Bhattithrips frontalis* (Bagnall)**

Described on a single female collected near Melbourne, Victoria, this species has since been collected widely

in eastern Australia northwards to Brisbane. It has only ever been found in low numbers, with no precise host association, and most of the available specimens come from south eastern Queensland, between Lamington National Park, Brisbane Forest Park, and Lake Broadwater near Dalby. The available males have well-developed forewings, but the length of these wings is no more than 70% of the length that would be considered fully macropterous. The redescription by Mound (1970) indicated that forewing length was also variable among females. The males have very small pore plates of unusual appearance that appear to over lie the antecostal ridge on sternites IV (or V) to VIII. The dorsal setae on tergite IX of males are small, but the lateral pair is long and extends beyond the abdomen apex.



FIGURES 13–18. *Bhattithrips* species. **(13)** *B. pitkini* tergites II–III. **(14)** *B. frontalis* tergites I–III.*B. dahmsi* 15–18: **(15)** tergites I–III; **(16)** meso and metanota; **(17)** tergites IV–VIII; **(18)** antenna.

***Bhattithrips pitkini* Mound**

Although described originally from a single female taken near Brisbane, Queensland, three females and one male have now been studied from Taree on the coast of New South Wales. These specimens were collected from leaves of *Claoxylon australe* (Euphorbiaceae). The tergites lack areas of microtrichia sub-laterally, in contrast to the other species of this genus (Fig. 13). Moreover, the sub-median areas of microtrichia on tergite II that occur in the other species are very weakly developed. In contrast, sternites III–VII have the prominent sub-circular areas with internal microtrichia that are typical of species in this genus.

Acknowledgements and depositaries

The holotypes of the new species are deposited in the Australian National Insect Collection, CSIRO, Canberra; paratypes where available will be deposited at the University of California, Riverside, and the Natural History Museum, London. I am grateful to many colleagues who have helped with field work or by providing specimens and plant identifications, including Mark and Christina Hoddle (née Stosic), Mary Finlay-Doney, Alexander Roberts, Andras Szitas, Desley Tree, Haidee Brown and Alice Wells.

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